MACTEC ENVIRONMENTAL RESTORATION SERVICES, LLC

Spectral Gamma-Ray Borehole Log Data Report

Log Event A

Borehole 10-06-12

Borehole Information

Farm : A	**Tank :** A-106	**Site Number :** 299-E25-73
N-Coord : 41,356	**W-Coord :** 47,598	**TOC Elevation :** 687.00
Water Level, ft : 100.00	**Date Drilled :** 5/31/1962	

Casing Record

Type : Steel-welded	Thickness, in. : 0.250	ID, in. : 4
Top Depth, ft. : 0	Bottom Depth, ft. : 110	
Type : Steel-welded	Thickness, in. : 0.280	ID, in. : 6
Top Depth, ft. : 0	Bottom Depth, ft. : 110	

Cement Bottom, ft. : 110 **Cement Top, ft. :** 108

Borehole Notes:

Borehole 10-06-12 was drilled in May 1962 to a depth of 75 ft with 6-in. casing. Data from the drilling log and Chamness and Merz (1993) were used to provide borehole construction information. In July 1978, the 6-in. casing was extended to a depth of 110 ft. An 18-ft length of temporary 8-in. surface casing was installed to facilitate the deepening of the borehole. The 6-in. casing parted at 54 ft during advancement, so a section of 4-in. casing was placed inside the 6-in. casing from the ground surface to the bottom of the borehole. The annulus between the 6-in. borehole casing and the 8-in. surface casing was stemmed with grout from 18 ft to the ground surface as the surface casing was removed. The bottom of the 4-in. casing was backfilled with grout from 110 to 108 ft. There is no mention that the 4-in. or 6-in. casing was perforated.

The thickness of the 6-in. casing is presumed to be 0.28 in.; the thickness of the 4-in. casing is presumed to be 0.25 in.

The top of the 4-in. borehole casing, which is the zero reference for the SGLS, is approximately flush with the ground surface.

Equipment Information

Logging System : 1	**Detector Type :** HPGe	**Detector Efficiency:** 35.0 %
Calibration Date : 10/1996	**Calibration Reference :** GJO-HAN-13	**Logging Procedure :** P-GJPO-1783

Logging Information

Log Run Number : 1	**Log Run Date :** 11/06/1996	**Logging Engineer:** Alan Pearson
Start Depth, ft.: 0.0	**Counting Time, sec.:** 100	**L/R :** L **Shield :** N
Finish Depth, ft. : 39.0	**MSA Interval, ft. :** 0.5	**Log Speed, ft/min.:** n/a

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Log Run Number :	2	**Log Run Date :**	11/07/1996	**Logging Engineer:**	Alan Pearson
Start Depth, ft.:	38.0	**Counting Time, sec.:**	100	**L/R :** L	**Shield :** N
Finish Depth, ft. :	89.0	**MSA Interval, ft. :**	0.5	**Log Speed, ft/min.:**	n/a

Log Run Number :	3	**Log Run Date :**	11/07/1996	**Logging Engineer:**	Alan Pearson
Start Depth, ft.:	102.0	**Counting Time, sec.:**	100	**L/R :** L	**Shield :** N
Finish Depth, ft. :	88.0	**MSA Interval, ft. :**	0.5	**Log Speed, ft/min.:**	n/a

Logging Operation Notes:

This borehole was logged by the SGLS in three log runs. The total logging depth achieved was 102 ft.

Analysis Information

Analyst : E. Larsen

Data Processing Reference : MAC-VZCP 1.7.9 Analysis Date : 03/18/1998

Analysis Notes :

The pre-survey and post-survey field verification for the logging run met the acceptance criteria established for peak shape and system efficiency. The energy calibration and peak-shape calibration from the accepted calibration spectrum that most closely matched the field data were used to establish the peak resolution and channel-to-energy parameters used in processing the spectra acquired during the logging operation.

A casing correction factor of 0.50 in. was applied to the concentration data during the analysis process because it most closely matches the combined thickness of the 4-in. and 6-in. casings of 0.53 in.

Log Plot Notes:

Separate log plots show the man-made and the naturally occurring radionuclides. The natural radionuclides can be used for lithology interpretations. The headings of the plots identify the specific gamma rays used to calculate the concentrations. Uncertainty bars on the plots show the statistical uncertainties for the measurements as 95-percent confidence intervals. Open circles on the plots give the MDL. The MDL of a radionuclide represents the lowest concentration at which positive identification of a gamma-ray peak is statistically defensible.

A combination plot includes the man-made and natural radionuclides, the total gamma derived from the spectral data, and the Tank Farms gross gamma log. The gross gamma plot displays the latest available digital data. No attempt has been made to adjust the depths of the gross gamma logs to coincide with the SGLS data.

Results/Interpretations:

The man-made radionuclide Cs-137 was detected in this borehole. The Cs-137 contamination was measured continuously from the ground surface to a depth of 19.5 ft. Several small zones of continuous Cs-137 contamination were detected between 22.5 and 42 ft; several isolated occurrences of Cs-137 were detected between 88 and 101.5 ft.

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The U-238 concentration values were absent from the ground surface to a depth of 4 ft. Zones of low K-40 concentrations occur from 1 to 3.5 ft and 7.5 to 14.5 ft. Slightly decreased K-40 concentration values occur from 54 ft to the bottom of the logged interval (102 ft).

Shape factor analysis was not used to determine the distribution of contaminants around this borehole because of the presence of grout or redistributed sediments around the upper portion of the borehole and because the Cs-137 count rates detected below the grouted or disturbed intervals were too low to produce valid CsSF1 values.

Additional information and interpretations of log data are included in the main body of the Tank Summary Data Report for tank A-106.